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FAIRFIELD COUNTY MATH LEAGUE (FCML) 2011-2012

Match 2 Round 1
Arithmetic: Factors and Multiples

1.) 4200

2.) 22050

3.) 124, 620

1.) How many 4 digit positive integers are divisible by 3 or 5 (or both)?

2.) Find the smallest positive integer n such $90720 \cdot n$ is a perfect cube.

3.) The LCM of a positive integer n and 40 is 1240. The GCF of n and 24 is 4. Find all possible values of n .

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Match 2 Round 2

Algebra I: Polynomials and Factoring

1.) 10, 11, 14, 25

2.) 5

3.) $(x+1)^2(x^2+1)(x^2-x+1)(x^4+1)$

1.) Find all positive integers h such that $3x^2 + hx + 8$ is factorable over the integers.

2.) If $a, b, c, d,$ and f are positive integers and $ax^2 + b^2x + c$ can be factored as $(dx + f)(fx + d)$, then what is the smallest possible value of b ?

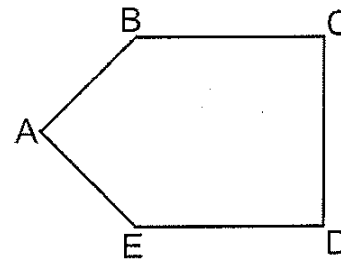
3.) Factor completely: $x^{10} + x^9 + x^8 + 2x^7 + 2x^6 + 2x^5 + 2x^4 + 2x^3 + x^2 + x + 1$

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Match 2 Round 3
 Geometry: Area, Perimeter,
 and Pythagorean Theorem

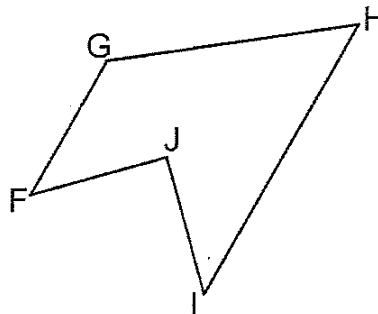
- 1.) $12\sqrt{2} + \frac{9}{2}$ ¹³ ¹⁴
- 2.) $\frac{4}{5}$
- 3.) $34 + 6\sqrt{3}$

1.) Pentagon $ABCDE$ has right angles A , C , and D . If $AB = AE = 3$, and $BC = DE = 4$, then find the area of pentagon $ABCDE$.



2.) A rhombus with one diagonal twice as long as the other diagonal and a square both have side lengths of 10. What is the ratio of the area of the rhombus to the area of the square?

3.) In concave pentagon $FGHIJ$, $\overline{FG} \parallel \overline{HI}$, $FG = 8$, $HI = 14$, $JF = 6 = JI$, and $m\angle I = 45^\circ = m\angle F$. Find the perimeter of $FGHIJ$.



FAIRFIELD COUNTY MATH LEAGUE (FCML) 2011-2012

Match 2 Round 4

Algebra II: Inequalities and Absolute Value

1.) $-25 < x < -4$

2.) $2 < x < 4$

3.) $x < \frac{2}{3}$ or $x > \frac{3}{2}$

1.) Solve for all real values of x : $x^2 + 29x + 100 < 0$

2.) Solve for all real values of x : $|x^2 - 3x| < x$

3.) Solve for all real values of x : $\frac{|x+1|}{|x-1|} < 5$

FAIRFIELD COUNTY MATH LEAGUE (FCML) 2011-2012

Match 2 Round 5
Trigonometry: Law of Sines
and Law of Cosines

1.) $\frac{41}{54} \cdot \frac{13}{27}$

2.) $\frac{6\sqrt{3}}{\sqrt{6} + \sqrt{3}}$

3.) $\frac{10}{10}$

1.) In scalene triangle ABC , the shortest side, a , is equal to 3 and the longest side, b , is equal to 9. If the length of c is an integer value, then find all possible values for $\cos C$.

2.) $\triangle ABC$ and $\triangle BCD$ share common side \overline{BC} . If $m\angle ABC = 60^\circ$, $m\angle BCA = 75^\circ$, $m\angle DBC = 45^\circ$, $m\angle BCD = 105^\circ$, and $DC = 12$, then find the length of segment \overline{AC} .

3.) In $\triangle ABC$, $\sin C = \frac{\sqrt{3}}{5}$ and $\cos A = \frac{1}{2}$. Find $\sin B$ if angle C is acute.

FAIRFIELD COUNTY MATH LEAGUE (FCML) 201¹³1-201¹⁴2

Match 2 Round 6
Coordinate Geometry: Writing
Equations of Lines

1.) $y = -x - 9$

2.) $y = -3x$

3.) $y = -5x - \frac{7}{5}$

1.) The line $y = x + 9$ is first reflected over the line $y = x$, and then reflected over the y -axis. Find the equation of the resulting line in slope-intercept form.

2.) Find the equation of the line containing the altitude from vertex I in $\triangle BIG$ if $B = (-1, 3)$, $I = (1, -3)$, and $G = (8, 6)$. Write your answer in slope-intercept form.

3.) Find the equation of the line that passes through the intersection point of the equations $10x = -4$ and $9x - 9y = -9$, and is perpendicular to the line $5y = \frac{-5x + 8}{-5}$. Write your answer in slope-intercept form.

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Match 2 Team Round

1.) What positive integer value n makes $\left|2^n - \frac{5 \cdot 10!}{9}\right|$ as small as possible? 21

2.) Factor completely: $x^2y - 3x^2 - xy^2 + 5xy - 6x - 2y^2 + 6y$ $(x-y)(x+2)(y-3)$

3.) A wire of length 20 in is cut into two pieces. One piece is used to form a triangle whose sides are in the ratio 3:4:5. The other piece is used to form a square. If the area of the triangle is $\frac{2}{3}$ the area of the square, then what is the area of the triangle? $\frac{25}{6} \text{ in.}^2$

4.) Solve for all real values of x : $\frac{3x+7}{-3x+1} \geq -5x+3$ $\frac{7}{5} \leq x < \frac{1}{3}$ or $x \geq \frac{4}{3}$

5.) The diagonals of quadrilateral $FCML$ are equal. If $m\angle F = 120^\circ$, $m\angle C = 120^\circ$, $m\angle M = 60^\circ$, $FC = 3$, and $CM = 4$, then find the perimeter of $FCML$. 18

6.) Find the equation of the line that passes through the intersection points of $y+3 = |x-2|$ and $y-5 = -|x+3|$. Write your answer in slope-intercept form. $y = -\frac{5}{8}x + \frac{11}{16}$